INDIANA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS MANAGEMENT

FAILED MATERIALS
Directive No. 112

Material or a finished product determined not to be in accordance with the applicable specifications or tolerances will be designated as a failed material. Failed materials will be reviewed to determine whether the material has resulted in acceptable work and should remain in place in accordance with 105.03. If the failed material is allowed to remain in place, a quality adjustment will be determined in accordance with 109.05.1.

Failed Materials Committee

The Failed Materials Committee will consist of the following:

1. Director, Materials Management, Chairman
2. State Materials Engineer
3. State Construction Engineer
4. District Testing Engineer

The Committee will hold meetings when a decision on an initial Failed Material adjudication cannot be reached by the procedures described below, or when reviewing and discussing appeal requests. The Chairman will cast a vote only if there is a tie vote among the Failed Materials Committee members. The Failed Materials Committee will meet upon call of the Chairman.

Failed Material Procedures

A Failed Material Notification and Resolution Report will be initiated by the District Testing Engineer when a Failed Material exists in accordance with the Standard Specifications. The District Testing Engineer may adjudicate the matter where designated by this Directive. Otherwise, the Failed Material will be forwarded to the Office of Materials Management (OMM) for adjudication. The appropriate subject matter expert at OMM will conduct an investigation, and prepare a memo and letter to adjudicate the Failed Material. The memo will be reviewed and approved by the Assistant State Materials Engineer and the State Materials Engineer prior to sending the letter to the Prime Contractor.

The Failed Material Notification and Resolution Report will list the following:

1. Contract, Purchase Order, or Permit number
2. The name of the material
3. The laboratory or test number
4. A statement of the reason for the failure
5. The specification requirement
6. A summary of comments made by the Project Engineer/Project Supervisor and District Testing Engineer on the failed materials report

7. Supporting information or documentation

The Failed Materials Committee will review all of the information available for each failed material item to determine whether the failure will require removal of the material. If the Failed Materials Committee determines that the work is acceptable, an appropriate adjustment in pay and/or remedial measures will be determined. The Failed Materials Committee will set guidelines as necessary to provide for efficiency and uniformity of evaluation of the failed material.

A letter will be written to the Prime Contractor by the State Materials Engineer concerning the Failed Materials Committee decision regarding the failed material. Copies will be sent to the District Construction Director, Project Engineer/Project Supervisor, District Testing Engineer, Producer, if applicable, and Committee members.

Appeals

The Prime Contractor may appeal the decision of the District Testing Engineer or Failed Materials Committee by sending written notification to appeal to the Chairman within 15 days of the date of written or electronic notification of the failure. The basis of appeal in detail shall be included in the written notification. If deemed necessary by the Chairman, a meeting with the Failed Materials Committee and Contractor will be held to discuss the details of the Failed Material and the appeal. The Chairman will review the appeal and send the decision in writing to the Prime Contractor.

District Testing Engineer

The District Testing Engineer is authorized to adjudicate a failed material and assess a quality adjustment for all failed materials with a credit schedule defined in the Failed Materials Appendix.

The District Testing Engineer will prepare a report for materials which fail to meet the applicable requirements of the Standard Specifications. The District Testing Engineer may consult with the Office of Materials Management in determining whether additional testing is needed or to verify the contents of the report. Failed materials not included in the Failed Materials Policy Appendix will be submitted to the Office of Materials Management. The failed materials submittal will include the quality control tests, original acceptance tests, and the appeal test results, if applicable.

State Materials Engineer

The State Materials Engineer is authorized to adjudicate a failed material for those materials with a credit schedule defined in the Failed Materials Policy Appendix where the value indicates FMC and other failed materials that do not require remove and replace adjudication.

APPENDIX

GENERAL

1. The credits will be cumulative to determine the total credit to be assessed.

2. The quality adjustment will be the actual calculated value of the credit for the material.

3. The pay factors for air voids, Vbe and density of QC/QA HMA will be reduced to 1.00 if the pay factors for these properties are above 1.00.

4. The cost of the investigation to determine the acceptability of the material will be included in the quality adjustment when the material is left in place. A minimum of $500 or the actual cost will be assessed.

5. The District Testing Engineer will determine all of the quality adjustments listed in the following tables except where FMC is indicated, which will require the adjudication by the Failed Materials Committee.

6. As described in 401.20, the $500 credit adjustment for appealed sublots that did not result in an improvement to the SCPF or Lot PF, is still in effect. If original results are considered failing, the original SCPF or Lot PF shall be determined using this policy for comparison to appeal results.

QC/QA HOT MIX ASPHALT -- Open Graded Mixtures

Binder Content -- Sublots with a binder content deviation from the DMF greater than 1.0% will be assessed a binder content pay factor of 0.00.

Air Voids -- Sublots with an air void deviation from the DMF greater than 5.0% will be assessed an air void pay factor of 0.50.

QC/QA HOT MIX ASPHALT -- Dense Graded Mixture ≥ One Lot

Lot PWL values for the air voids, Vbe, or in-place density (%Gmm) less than 50 will have pay factors determined from the following formula and as indicated in the table.

$$PF = \frac{100 - \left(0.000020072x(100 - PWL)^{3.5877}\right)}{100}$$

Pay Factors										
PWL	9	8	7	6	5	4	3	2	1	0
40	0.73	0.71	0.69	0.67	0.65	0.62	0.60	0.57	0.55	0.52
30	0.49	0.46	0.43	0.39	0.36	0.32	0.29	0.25	0.21	0.16
20	0.12	0.07	0.03	FMC	FMC	FMC	FMC	FMC	FMC	FMC
10	FMC	FMC	FMC	FMC	FMC	FMC	FMC	FMC	FMC	FMC
0	FMC	FMC	FMC	FMC	FMC	FMC	FMC	FMC	FMC	FMC

Vbe – Lots with a Vbe PWL < 27 will be assessed a Vbe pay factor of 0.00.

QC/QA HOT MIX ASPHALT -- Dense Graded Mixture < One Lot

Air Voids -- Sublots with an air void deviation from the DMF greater than 2.0% will be assessed an Air Void pay factor as follows:

Air Voids, %				Deviation	Air Void PF
Superpave 4		Superpave5			
1.9	6.1	2.9	7.1	2.1	0.69
1.8	6.2	2.8	7.2	2.2	0.62
1.7	6.3	2.7	7.3	2.3	0.55
1.6	6.4	2.6	7.4	2.4	0.48
1.5	6.5	2.5	7.5	2.5	0.42
1.4	6.6	2.4	7.6	2.6	0.35
1.3	6.7	2.3	7.7	2.7	0.28
1.2	6.8	2.2	7.8	2.8	0.22
1.1	6.9	2.1	7.9	2.9	0.15
1.0	7.0	2.0	8.0	3.0	0.09
< 1.0	> 7.0	< 2.0	>8.0	FMC	

Volume of Effective Binder -- Sublots with a Vbe that deviates more than 2.0% below specification minimum will be assessed a Vbe pay factor of 0.00. Sublots with a Vbe that deviates more than 3.0% above specification minimum; FMC.

Density -- Sublots with an in-place density (%Gmm) outside of the ranges in 401.19(b) will receive a Sublot Composite Pay Factor (SCPF) as follows:

Density, % Gmm				SCPF
Superpave4		Superpave 5		
88.9	97.0	89.9	98.0	0.53
88.8	97.1	89.8	98.1	0.50
88.7	97.2	89.7	98.2	0.45
88.6	97.3	89.6	98.3	0.42
88.5	97.4	89.5	98.4	0.38
88.4	97.5	89.4	98.5	0.35
88.3	97.6	89.3	98.6	0.32
88.2	97.7	89.2	98.7	0.27
88.1	97.8	89.1	98.8	0.23
88.0	97.9	89.0	98.9	0.20
< 88.0	> 97.9	< 89.0	> 98.9	FMC

HOT MIX ASPHALT (402 HMA)

For assessing a credit to the contract, the following material values will be used:

HMA Curbing ---------- Binder Index @ 7.0% + $15.00/ton aggregate @ 93.0%

HMA for Temporary Pavement
- Base ---------- Binder Index @ 4.5% + $15.00/ton aggregate @ 95.5%
- Intermediate -------- Binder Index @ 5.0% + $15.00/ton aggregate @ 95.0%
- Surface ---------- Binder Index @ 6.0% + $15.00/ton aggregate @ 94.0%

HMA Patching
- Base ---------- Binder Index @ 4.5% +$15.00/ton aggregate @ 95.5%
- Intermediate -------- Binder Index @ 5.0% +$15.00/ton aggregate @ 95.0%

The following credit schedules will be applied to the contract bid price of the mixture:

Mixture

AIR VOIDS	
Deviation from DMF (%)	**% Credit**
>2.0 and ≤ 2.2	5
> 2.2 and ≤ 2.4	10
> 2.4 and ≤ 2.6	20
> 2.6 and ≤ 2.8	30
> 2.8 and ≤ 3.0	50
> 3.0	FMC
BINDER CONTENT	
Deviation from DMF (%)	**% Credit**
> 0.7 ≤ 1.5	5.0 for each 0.1 % above 0.7
> 1.5	FMC

Low Temperature Density

Density, % MSG		% Credit
Superpave 4	**Superpave5**	
≥ 97.0	≥ 98.0	FMC
91.0 - 91.9	92.0 - 92.9	0.4 for each 0.1 % below 92.0 (93.0 S5)
90.0 - 90.9	91.0 - 91.9	4.0 + 0.8 for each 0.1 % below 91.0 (92.0 S5)
88.0 - 89.9	89.0 - 90.9	12.0 + 2.0 for each 0.1 % below 90.0 (91.0 S5)
≤ 87.9	≤ 88.9	FMC

COLD MIX ASPHALT (CMA)

The following credit schedule will be applied to the contract bid price of the mixture:

Test	% Credit
Gradation	For each 0.1% -- 0.1 % credit
Asphalt Content	For each 0.1% -- 5 % credit
Crushed Content	For each 0.1% -- 0.2 % credit

PERFORMANCE GRADED ASPHALT BINDERS

More than one credit per binder sample may be assessed. The following credit schedule will be applied to the binder index for the month of the failure. Per 902.01(a)2, the failure represents one week of HMA production.

Dynamic Shear Rheometer			**Bending Beam Rheometer**			**Bending Beam Rheometer**		
RTFO Material			**PAV Material**			**PAV Material -- M value**		
Required: ≥ 2.20 kPa			**Required: ≤ 300 Mpa**			**Required: ≥ 0.300**		
		%Credit			%Credit			%Credit
2.10	< 2.20	2.5	> 300	315	2.5	0.285	< 0.300	2.5
2.00	< 2.10	5.0	> 315	330	5.0	0.270	< 0.285	5.0
1.90	< 2.00	10.0	> 330	345	10.0	0.255	< 0.270	10.0
1.80	< 1.90	15.0	> 345	360	15.0	0.240	< 0.255	15.0
1.70	< 1.80	20.0	> 360	375	20.0	0.225	< 0.240	20.0
1.60	< 1.70	30.0	> 375	390	30.0	0.210	< 0.225	30.0
1.50	< 1.60	40.0	> 390	405	40.0	0.195	< 0.210	40.0
1.40	< 1.50	50.0	> 405	420	50.0	0.180	< 0.195	50.0
N/A	< 1.40	*	> 420	N/A	*	N/A	< 0.180	*

* Credits in excess of 50.0 % for an individual test or the accumulation of an excess of 50.0 % for all tests will be adjudicated by the Failed Materials Committee.

PCC THIN CONCRETE OVERLAY

The following credit schedules will be applied to the contract bid price of the item:

Percent Deduction for Thickness

	CD - DD						
		-0.1	-0.2	-0.3	-0.4	-0.5	< -0.5
ACD - DD	≥0.0	0%	5%	10%	25%	30%	Remove & Replace
	-0.1	4%	10%	15%	25%	30%	
	-0.2		15%	20%	30%	35%	
	-0.3			25%	35%	40%	
	-0.4				40%	45%	
	-0.5					50%	

FMC Sublot Pay Factors for Thickness

	CD - DD						
		-0.1	-0.2	-0.3	-0.4	-0.5	< -0.5
ACD - DD	≥0.0	1.00	0.95	0.90	0.75	0.70	Remove & Replace
	-0.1	0.96	0.90	0.85	0.75	0.70	
	-0.2		0.85	0.80	0.70	0.65	
	-0.3			0.75	0.65	0.60	
	-0.4				0.60	0.55	
	-0.5					0.50	

CD – Core Depth of shortest individual core (inches)
DD – Design Depth of thin PCC overlay (inches)
ACD – Average Core Depth of two cores (inches)
- Defined in Standard Specifications (not a failed material)